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A
TENTH
LETTER
To Sir JOSEPH BANKS Baronet
Preſident of the Royal Society,
ON THE
Subject of Cochineal Inſects, diſcovered at Madras,

By, *JAMES ANDERSON* M. D.

With a Copper Plate Engraving Annexed, of the different INSECTS mentioned in the Letters, from the Drawings of BARON REICHEL.

Alſo an Engraving of the *Opuntia Major Spinulis obtuſis mollibus, & innocentibus,* and the Plan of a Nopalry in the Biſhoprick of Guaxaca in the Kingdom of Mexico, Extracted from the Second Volume of SIR HANS SLOANE'S HISTORY OF JAMAICA, for the uſe of Country Gentlemen who may be diſpoſed to make Plantations, and are not in poſſeſſion of that Work.

> ——————MILESIA MAGNO
> VELLERA MUTENTUR, TYRIOS INCOCTA RUBORES.
> VIRG. GEOR. LIB. 3.

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MDCCLXXXVII.

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BRITISH MUSEUM

To Sir JOSEPH BANKS Baronet
Preſident of the Royal Society.

Dear Sir,

IN my laſt Letter I acquainted you, that the *Coccus* of the *Guava* Tree had entirely diſappeared, very few of the *Chloeoon* were to be found, and that the only Inſect I had thriving, was the *Coccus* of the *Phyllanthus Emblica* on the *Miniſpermum Cordifolium.*

This Inſect being *Oviparous* is incapable of removing from one place to another after it has attached itſelf to the plant it feeds on, and is once ſurrounded with a clue of ſilk—Yet as the *Phyllanthus Emblica* Trees were covered with them immediately after the Monſoon, which Trees they have ſince quitted and during the hot ſeaſon could only be found on the *Miniſpermum Cordifolium* and *Parietaria*, there can be no doubt of their ſeeking ſhelter on a Tree againſt the flood of water in the rainy ſeaſon, and betaking themſelves to humble plants at a time when ſap is defective on Trees.

It is alſo evident this migration from the Tree is effected by the young ſoon after they quit the ſhell; for when quarter grown, they attach themſelves to the leaf, acquire gradually a white covering by ſome perſpiration or exudation from their bodies, congealing over it's ſurface, and when near full grown wrap themſelves up for life in ſilk, amongſt the threads of which they depoſit their eggs.

During the hot ſeaſon their eggs have hatched near the ſurface of the earth in a temperament equal to that for hatching Pullets eggs, and being ſheltered under the green leaf of the *Miniſpermum*, and *Parietaria*, run leſs riſque of being burned up in that ſituation, than expoſed on the branch of a leafleſs Tree, to a ſtrong current of hot air.

Thoſe found laſt year, however, on the *Phyllanthus Emblica*, muſt have been hatched in a lower degree of heat, and much greater moiſture of the atmoſphere, and however prejudicial moiſture may be found to the evolution of the eggs of birds, it muſt be admitted great variety occurs in this matter with the eggs of different animals, depending on the nature of the animal, as well as the texture of the eggs.

About 17 years ago I had *Cacoons* of that ſpecies of *Phalœna*, which affords ſilk for making the ſtuff called *Muggadootys* in Bengal, collected in February and March, (here they are put into the fire to burn, as their ſmoke is eſteemed ſerviceable to releive perſons affected with *Epilepſia Hypochondria*, or *Hyſteria*,) theſe *Cacoons* lay in the chamber of a dwelling houſe, from the time they were collected 'till November following, when the Feve diſcharged a fluid, which diſſolved the ſtrong ſilky priſon, in which it had been ſo long confined.

In half an hour after iſſuing from the *Cacoon* the wings of the Inſects were ſo dry, they could fly about the Chamber, when the female admitted acceſs of the male, and immediately after began to depoſit eggs about the ſize and ſhape of Radiſh ſeed.

The average number of eggs each female depoſited in the courſe of eight days, amounted to about 150; the eggs adhered to each other, and to the windows of the Chamber where the Inſects choſe to place them, with a moiſt gluten; the Flies would taſte no food, but ſoon after depoſiting their eggs, beat their wings to pieces on the lattice of the Windows, and expired about 14 days after they had quitted the *Cacoons*.

I was, at that time, interrupted from any farther iuveſtigation of this nature, but have no doubt the eggs were prolific, at a time when the Atmoſphere was loaded with moiſture, and the only ſeaſon of the year, when the young *Caterpillar* of ſo large an Inſect, could certainly be ſupplied with ample food, and I have great reaſon to believe their remaining eight months in a *Chryſalis* ſtate depended more on the dryneſs of the enſuing ſeaſon than the particular nature of the Inſect; for looking back to my Journal of them, it appears by the 14th of April, no *Cacoons* could be found in the woods, but ſuch as the *Fève* had eſcaped from.

It may likewiſe not be improper to obſerve the great difference in ſize which obtains amongſt Inſects; having weighed 14 of theſe Cacoons the largeſt amounted to four Drachms and fifteen Grains, and the ſmalleſt only to one Drachm and twenty three grains, the average quantity of Silk on each was about 16 Grains.

They were collected from four different kinds of Trees (viz) the *Naga*, *Yellanda*, *Nelli-Madthi*, or *Mardana*, and *Talla-Tumma* of the *Tamuls*; the *Naga* is the *Jombolifera Pedunculata* L. S. N, ed. XII. p. 266 *Flor Zeylan* No. 139, the *Yellanda*, the *Rhamnus*, the *Nelli-Madthi*, the *Termiunalia-Mardan*, and the *Talla-Tumma*, the *Mimoſa Japonica* of *Koning*. this laſt is deſcribed in a letter inſerted in the London Medical obſervations, from Mr. Kerr Surgeon in Bengal to Dr. Fothergill.

It cannot be preſumed inſects have ſo much ſagacity as to know the courſe of future ſeaſons, but it may readily be allowed that both they and their *Ova* have power of ſuſtaining different degrees of heat, and are ſubject to its influence in ſome meaſure ſimilar to other living animal bodies. In Bengal the Peaſants haſten the evolution of ſilk-worm's eggs by wrapping them round their bodies.

The variety in this reſpect is remarkable when we conſider, that the eggs of fiſhes in this Country muſt be lodged in mud, at the bottom of lakes which are entirely dried up in the hot ſeaſon, and the mud rendered as hard as a ſtone, on which Farenheits Thermometer will riſe every noonday for above a month together, to more than 120 degrees.

This degree of heat and dryneſs being found ſufficient to evaporate the more volatile particles of the *Albumen* of eggs, yet it would ſeem that the eggs of Fiſhes conſiſting chiefly of *Vitellum* are capable of ſuſtaining it unhurt, for I have frequently ſeen ſhoals of young fry in the waters of theſe Lakes ſoon after a fall of rain, the ambient water ſupplying the place of *Albumen* to Fiſh eggs, and during their evolution I have obſerved it's temperature below 80 degrees owing to the coolneſs of the rain and conſequent evaporation from the ſurface of pools.

From the Phillippine Iſlands a conſiderable exportation of Ducks eggs is made to China, by preſerving the eggs in dry mud; the Ducks for ſupport of this trade are hatched in dung at a village named *Taggey*, on the bank of the great *Lagoona* near Manilla.

The Alligator, Turtle, Serpent, and Lizard, all of which are *Oviparous*, and their eggs furniſhed with abundance of *Albumen*, the *Albumen* of Turtles eggs indeed leſs coagulable than that of other animals, yet nature has fully provided againſt its evaporation, and conſequent abſtraction in that way of the principle of life from the *Cicatricula*; for the Alligator digs a hole in the earth, and buries her eggs ten or twelve inches under ground, returning when the young break the ſhell to dig them out again; the moment they are hatched they hiſs, and will ſeize any thing preſented to them—The Turtle covers her eggs with wet ſand on the ſea ſhore or bank of a river ; Serpents and Lizards, chooſe holes in the earth remote from any current of dry air, in which they depoſit their eggs and leave them to the influence of a humid Atmoſphere, when their young appear moſt numerous.

The germ or *Ova* of *Viviparous* animals impregnated by the male are cheriſhed within the body of the mother till their perfect evolution, but in *Oviparous* animals, when the egg is ſeparated from the female, although impregnated by the male, there ſtill requires the genial healthy temperament of the mother to be ſuper-added for their perfect evolution.

That this temperament is neither heat alone, moiſture alone, nor air alone, is obvious from the nature of animal bodies ; but a due aſſemblage of theſe, conſiſtent with the peculiar nature of the animal.

The eggs of fiſh evolve in water, thoſe of birds in air, and the quantity of heat neceſſary to each of theſe different animals may in ſome degree be eſtimated, ſeeing the Salmon ſollicits the ſhallow ſources of the ſtream to depoſit her eggs, which evolve in melted Ice and Snow.

In wells here about 15 feet deep it is found the Thermometer ſtands at the hotteſt as well as 'the coldeſt ſeaſon of the year when immerſed, in their waters at 82° ½ which is the mean betwixt our leaſt and greateſt heat of the ſhaded air, and from what I have obſerved, the pools of water where their ſurface is expoſed bring the Quickſilver in the Thermometer as low as 80° after a fall of rain, from which, and the temperament in which fiſh fry appear in Northern climates, it may be inferred the eggs of this cold blooded animal are evolved in any degree of heat betwixt 32° and 80° which however muſt appear of conſiderable extent when numberleſs experiments demonſtrate in all climates at leaſt 104 neceſſary for the evolution of the eggs of birds, and that they do not endure above 108°, nor any perceptible moiſture, without eminent diſadvantage.

Between the eggs of birds and fiſhes therefore it appears there is a marked difference, in the proportion of heat and moiſture neceſſary to their evolution.

Thus the reptile tribe approach nearer the nature of fiſhes, than birds, in the degree of heat and moiſture neceſſary to evolve their eggs, but Inſects furniſhed variouſly by nature ſeem intermediate, and in this *Coccus* of the *Phyllanthus Emblica*, the clue of ſilk in which they depoſit their eggs may likewiſe ſerve to ſhelter them from the heavy rain of the MONSOON——

Ever ſince the middle of June when the Monſoon rages on the Malabar Coaſt, we have had refreſhing ſhowers of rain, admitting a preparation of the ſoil for what is called the *Chumba* by the *Tamuls*, or crop of various kinds of grain, and the country has a verdant appearance.

The *Termes* flys off from its ſubterranean excavations, and leaving its wings on whatever place it happens to alight, becomes an eaſy prey to Birds, Reptiles, and Fiſh.

The wary Peaſant, deſirous of participating this rich repaſt, watches their emigration, and after glutting himſelf, comes home loaded for the Market, where they are ſold by meaſure, at the price of Rice.

The *Guava Coccus* begins to appear on the *interſtices* of the *Squamæ* of the fruit of the *Annona*, and the *Chloeoon* is as abundant on the ſalt graſs, as it was in December laſt—I will therefore only farther

encroach

encroach on your patience by inſerting the following accounts, as they convey ſome idea of the ſtate of the weather on different parts of the Coaſt, as well as the probability of collecting the *Chloeoon* in quantity; and diſcovering more Inſects than I have yet mentioned, of the *Coccus* kind.

“ Samalcotta 23d, of Auguſt 1787.

“ My Dear Sir,

“ ONLY Yeſterday did I receive your favour of the 10th, with its incloſures, the rains have
“ been ſo very violent hereabout, for a length of time that we are ſometimes three days without a
“ *Tappal*.

“ The *Cactus* ſlips which were ſent me by the *Danſbrog*, I have received and have planted them
“ immediately under my eye in my garden, and as they ſhoot out *Ramuli*, I will remove them to
“ a Plantation out at the Pepper Gardens, which is inland from this about ſix miles, and from the
“ neareſt part of the ſea eight or twelve miles.

“ The place is near the firſt range of hills, and is well ſheltered by innumerable *Mango Topes*, I
“ have no doubt but what it is as good a ſituation as can be found any where on the Coaſt.

“ No ſpecies of the *Cactus* grows any where hereabout—I have conſtantly people going and
“ coming from the hills collecting Pepper Plants, I ſhall ſhow them the Plant, and direct them to
“ keep a look out for any thing they can ſee like it.

“ I have alſo a man conſtantly employed amongſt the hills collecting me ſeeds and ſpecimens of
“ Plants, he ſhall alſo be inſtructed to look particularly for the Plants of that *Genus*, I fear the
“ *Chloeoon* Inſect will not be found hereabout for ſome time on account of the late Inundation—Laſt
“ year I ſaw many of them near the ſea by *Cockanara*, I ſhall however diſtribute your Advertiſements
“ amongſt the moſt intelligent of the Natives, and do otherwiſe all I can to procure you a quantity.

“ I am &c.

“ WILLIAM ROXBURGH.”

“ Maſulipatam Aug. 24th 1787.

“ DEAR SIR.

“ THE rains which have continued here almoſt without interruption ſince the 20th of May,
“ being now greatly abated, I ſent out my people ſome days ago to examine the graſs, and
“ Guava trees, and to bring me what eggs and Inſects they found upon them, of ſuch as they have
“ brought I now encloſe you muſters that you may direct me in collecting the proper kind.

“ No 1 is the graſs egg. No. 2 is the inhabitant Of the trunk of the Guava tree dried and pick-
“ ed, No. 3 is the inhabitant of the Guava leaf, which appears to be a different ſpieces of Inſect,
“ and has no red juices; and No. 4 is an Inſect taken this morning from the Portia tree, but being
“ now alive, and not having had time to dry and prepare it, I fear it will ſpoil ere you have an op-
“ portunity of examining it, but it appears to be the the ſame kind of Inſect with the one on the
“ Guava tree and the ſame purple juice of the ſame kind on the *Love Apple tree*.
“ On the 30th of July I wrote you information concerning an Inſect I found on the *Moochy tree*

“ in

“ in great numbers, but as you have ſaid nothing about it, in your Letter of the 12th Inſtant, this day received, I ſuppoſe it has no connection with your diſcovery.

“ I beg you will be aſſured that as ſoon as your anſwer to this letter arrives in order to guide me in the choice of the Inſects, not a moment ſhall be loſt in begining the deſired collection, but I think it neceſſary at the ſame time to acquaint you, that they are at preſent very young, and very ſcarce, and thoſe of the graſs the ſcarceſt of all, and that thoſe in the different quills now encloſed is a whole days collection, but as the people employed, ſay that there are numbers of young ones near the old; I am in hopes they will be plentier every day.

“ Mr. Revel who ſets out this day for the Iſle of Divi, Bopetla, and Yentipollum, has promiſed to enquire very particularly about the Cochineal Thiſtle. and Dr Boſwal at Condapilly has promiſed to ſearch in that neighbourhood.

“ In all other places hereabout I have aſcertained the fact, that no ſuch plant grows native, within fifty miles of Maſſulipatam.

“ I am &c.

ROB. TURING.

Vellore Auguſt 29th 1787.

“ Dear Sir.

“ THIS accompanies a bottle which contains about four ounces of the Vellore Cochineal, which I have collected and prepared, nearly agreeable to the directions which you publiſhed ſometime ago.

“ I do not think it ſufficiently dry, but I wiſhed to ſend you a ſpecimen of my preparation early, and beg your opinion whether you think it perfectly dry, or requires a longer expoſure to the Sun.

“ The encloſed is a bit of Flannel which after being ſoaked in allum water, I dyed with about ten grains of the Cochineal, and half a Drachm of Tartar in about a pint of boiling water, the proceſs was haſtily conducted, and I therefore hope you will make allowances.

“ It has been waſhed ſeveral times ſince, and the water remained clearly untinged after the laſt waſhing, I ſhould have preferred a bit of cloth, but I could not get any of a white colour.

“ If you approve of the Cochineal pleaſe to let me know and I ſhall continue collecting for you.

I am &c.

TERRENCE GAHAGAN.

Since the receipt of the above Letters, I have found ſome *Phaſeoli* ſheltered by a wall, entirely covered with the *Guava Coccus*.

I am with much eſteem,
Dear Sir your obedient humble Servant,
JAMES ANDERSON.

Fort St. George,
Sept. 12th 1787.

Mr. [illegible]

57 Marlbro' St—

G.R. III BRITISH MUSEUM